BEST AVAILABLE IMAGES

Defective images within this document are accurate representation of The original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

TCA Translation

(19) Japanese Patent Office (JP) (11) Kokai Number

(12) **Kokai* (A)** S62-254626

(51) Int. Cl.[4] Ident. No. JPO No. (43) Kokai Date: Nov. 6, 1987
H02J 1/10 7103-5G

Number of Inventions: 1 Inspection Request Status: Not Requested (3 Pages in All [In Original Document])

(54) Direct Current Parallel Operating Device

(21) App. Number: S61-98558
(22) Date Filed: April 28, 1986

(72) Inventor: Sadao Morita c/o Meidensha Corporation, 2-1-17 Osaki, Shinagawa-ku, Tokyo
(72) Inventor: Kei'ichi Tanaka c/o Meidensha Corporation, 2-1-17 Osaki, Shinagawa-ku, Tokyo
(71) Applicant: Meidensha Corporation 2-1-17 Osaki, Shinagawa-ku, Tokyo
(74) Agent: Fujimi Shiga, Benrishi [Patent Agent]

*Publication of Unexamined Patent Application

SPECIFICATION

1. Title of the Invention

Direct Current Parallel Operating Device

2. Scope of the Claims

[What is claimed is:]

(1) A direct current parallel operating device characterized by being configured such that alternating-current output from a commercial power source, an internal combustion engine driven alternating-current generator, or wind generating equipment is converted into direct current via a rectifying device, and direct-current output of a solar cell or a fuel cell is adjusted in polarity and voltage together with the output of the rectifying device and fed to a direct-current bus bar.

3. Detailed Description of the Invention

A. Industrial Field of Application

The invention relates to a direct current parallel operating device used in building facilities and other electrical systems.

B. Summary of the Invention

In the direct current parallel operating device of the invention, alternating-current output from an internal combustion engine (hereinafter referred to as "engine") driven alternating-current generator or wind generating equipment is rectified, and direct-current output of a solar cell or a fuel cell is adjusted in polarity and voltage together with the output of the rectifying device and fed to a direct-current bus bar, and as such, the steps of synchronous parallel operation and controlling of active and reactive power associated with parallel alternating-current power control are eliminated.

C. Prior Art

Conventionally, parallel operating devices for two or three low-capacity, engine-driven alternating current generators have been used as in house generating equipment at factories and other buildings. To bring about energy conservation, fuel cells and solar cells have been made practical and are operated in parallel with electric distribution systems. In addition, the electricity generated with wind-power generating equipment is temporarily converted to direct current and stored in storage batteries, converted to alternating current via an inverter, and used as electricity.

TCA Translation

D. Problems the Invention is to Solve

Normally, the parallel operation of the alternating-current electricity from an in-house generating facility and the direct-current electricity from a fuel cell, solar cell, or similar device was performed by converting the direct-current electricity into alternating-current electricity with an inverter. But such an action problematically requires uniform frequency control, active power distribution control, reactive power control, and the control of other complex phenomena.

E. Means for Solving the Problems

In order to bring a solution to these problems, alternating-current output from an engine-driven alternating-current generator or wind generating equipment is rectified to direct current, and direct-current output of a solar cell or a fuel cell is adjusted in polarity and voltage together with the output of the rectifying device and fed in parallel to a direct-current bus bar.

F. Operation of the Invention

Configured in this manner, the invention need only adjust to the same output voltage and match polarity when feeding to a direct-current bus bar both rectified direct-current electricity of an engine-driven alternating-current generator or wind generating facility and the direct-current electricity of a solar cell, fuel cell, or other device. There is no need for uniform frequency control and active and reactive power distribution control associated with alternating-current parallel operation.

G. Working Example

Hereafter, a working example of the invention will be discussed in reference to the drawing. The appended drawing, as an example of this working example, is an electric circuit diagram of a distribution system leading to a factory or other building. In the drawing, a commercial receiving power source 2 connected to a terminal board 1 is connected to direct-current bus bars P and N via a first rectifying device 3. The alternating-current output of an alternating-current generator 6 for in-house generation, driven by an engine 5 at a high rate of rotation (4,000–6,000 rpm), is fed to the direct-current bus bars P and N via a second rectifying device 7 and is adjusted to the polarities of the direct-current bus bars P and N and adjusted in output voltage. The alternating-current output of an alternating-current generator 6a for in-house generation, driven by an engine 5a at a moderate rate of rotation (2,000–2,700 rpm), is fed to the direct-current bus bars P and N via a third rectifying device 7a and is adjusted to the polarities of the direct-current bus bars P and N and adjusted in output voltage. The direct-current output of a solar cell 8 and a fuel cell 9 is directly fed so that it is adjusted to the polarities and output of the direct-current bus bars P and N. The alternating-current output of a wind generator 10 is fed so that it is adjusted to the polarities and output of the direct-current bus bars P and N via a fourth rectifying device 11. Item 12 is an induction motor, and the electricity from the direct-current bus bars P and N is supplied to the motor 12 via an inverter 13. Item 14 is a direct-current load, item 15 is a storage battery to protect against power outages, and the storage battery 15 is charged, for example, according to the floating method.

With this working example configured as noted, the commercial power source 2 is rectified with the first rectifying device 3, and the engine-driven generators 6 and 6a are rectified with the second and third rectifying devices 7 and 7a. Then, the output of generating facilities such as the solar cell 8 and the fuel cell 9 is directly fed to the direct-current bus bars P and N, and the output of the wind generator 11 [sic: 10] is done so with the fourth rectifying device 11. As such, each direct-current output can be fed to the bus bars P and N simply by adjusting the polarities and voltages thereof and can be handled more easily than the alternating-current distribution method associated with the prior art. Therefore, the direct-current load 14 should be connected to the direct-current bus bars P and N and connected to the alternating-current load 12 via the inverter 13, a type of device in wide practical use. Connecting the storage battery 15 to the direct-current bus bars P and N allows the working example to double as an uninterrupted power supply.

TCA Translation

H. Effects of the Invention

The invention, configured in the above manner, brings about the following effects:

(1) The invention is a distribution system configured such that direct-current generating facilities or alternating-current generating facilities [whose output is] converted to direct current are connected to a direct-current bus bar, so it is simplified in configuration and operation because the synchronous parallel input associated with alternating-current distribution systems is not necessary.

(2) The invention operates with direct current supplied in a parallel manner, so the output voltages of the direct-current power sources need only be adjusted and connected in parallel, and no control of active power and reactive power associated with parallel alternating-current supply is needed.

(3) In the invention, direct current is supplied in parallel to a direct-current bus bar, and a storage battery for uninterrupted power supply is connected to the direct-current bus bar, so any increase in the output of an engine-driven alternating-current generator connected to the bus bar due to fluctuation in the rate of revolution of the engine is not problematic. In alternating-current distribution systems, the rate of speed fluctuation of engines that drive generators determines the displacement of the active power level. The invention is thus characterized in that the engine speed fluctuation rate need not be regulated.

(4) In the invention, direct current is supplied in parallel to a direct-current bus bar, so the number of revolutions of engines that drive engine-driven generators connected to the direct-current bus bar can be selected as desired, and the engines can be operated at a speed of maximum efficiency. In alternating-current generation, the number of rotations of alternating-current generators is regulated according to the formula $N = (120/P) \times f$ (where P is the number of electrodes and f is the power source frequency).

(5) The invention employs a direct-current distribution method, so any voltage drop of the on-site bus bar or bus duct is reduced. In alternating-current distribution systems, reactors and the skin effect contribute to voltage drops, so voltage drops in such systems are greater than they are in the invention.

(6) Connecting a storage battery in parallel to the bus bar turns the invention into an uninterrupted power supply.

4. Brief Description of the Drawings

The drawing is an electric circuit diagram of one working example of the invention.

2: commercial receiving power source; 3, 7, 7a, 11: first through fourth rectifying devices, P, N: direct-current bus bars; 5, 5a: engines; 6,6a: alternating-current generators; 8: solar cell; 9: solar cell [sic: fuel cell]; 10: wind generator; 12: induction motor; 13: inverter; 14: direct-current load; 15: storage battery

[Drawing here]

⑲日本国特許庁(JP) ⑪特許出願公開

⑫公開特許公報(A) 昭62-254626

⑤1Int.Cl.⁴ 識別記号 庁内整理番号 ⑬公開 昭和62年(1987)11月6日
H 02 J 1/10 7103-5G

審査請求 未請求 発明の数 1 (全3頁)

⑤4発明の名称 直流電力並列運転装置

⑳特願 昭61-98558
㉒出願 昭61(1986)4月28日

⑦2発明者 森田 貞夫 東京都品川区大崎2丁目1番17号 株式会社明電舎内
⑦2発明者 田中 敬一 東京都品川区大崎2丁目1番17号 株式会社明電舎内
⑦1出願人 株式会社明電舎 東京都品川区大崎2丁目1番17号
⑦4代理人 弁理士 志賀 富士弥

明 細 書

1. 発明の名称

直流電力並列運転装置

2. 特許請求の範囲

(1) 商用電源、内燃機関駆動交流発電機および風力発電装置の交流出力は各々整流装置を介して直流に変換し、太陽光電池や燃料電池の直流出力は、前記整流装置の出力とともに電圧および電圧値を調整して直流母線に供給するように構成したことを特徴とする直流電力並列運転装置。

3. 発明の詳細な説明

A. 産業上の利用分野

本発明は工場、ビルデング施設等の電力系統として使用される直流電力並列運転装置に関する。

B. 発明の概要

本発明は直流電力並列運転装置において、内燃機関(以下エンジンと称す)駆動交流発電機や風力発電装置の交流出力は整流させ太陽光電池、燃料電池の直流電力は電圧と電圧値を前記整流出力と合わせて直流母線に供給することにより、交流電力による並列運転における同期並列運転、有効・無効電力制御を省略するものである。

C. 従来の技術

従来、ビルデングや工場などの自家用発電設備として2～3台の小容量エンジン駆動交流発電機の並列運転装置が普及されている。また、エネルギー対策として、燃料電池、太陽光電池が実用化され電力配電系統と並列運転されるようになった。さらに、風力発電装置は発生電力を一旦直流に変換して蓄電池に貯え、インバータを介して交流に

変換し電力利用しているのが現状である。

D．発明が解決しようとする問題点

上記自家発電設備による交流電力と燃料電池や太陽光電池などの直流電力との並列運転を行うには通常直流電力をインバータにより交流電力に変換させて行うようにしていた。しかし、この場合には一定周波数制御、有効電力配分制御、無効電力制御など複雑な制御を必要とする問題がある。

E．問題点を解決するための手段

本発明は上記問題点を解決するために、エンジン駆動交流発電機や風力発電装置の交流出力は整流して直流電力に変換し太陽光電池や燃料電池の直流出力電力は前記直流電力と極性および電圧値を調節して直流母線に並列給電したものである。

F．作用

本発明は上記構成によって、エンジン駆動交流発電機、風力発電設備の整流された直流電力と太陽光電池や燃料電池等の直流電力を直流母線へ給電するときは、同一出力電圧値に調節し、かつ極性を合わせて供給するだけでよく、交流電力による並列運転のように、一定周波数制御、有効・無効電力配分制御の必要がない。

G．実施例

以下、本発明の一実施例を図面を参照して説明する。添付図面は本実施例としての工場やビルディング施設等への配電系統の電気回路図である。同図において、端子盤1に接続された受電商用電源2は第1整流装置3を介して直流母線P，Nに接続される。エンジン5で駆動されて高速回転の(1,000～8,000RPM)する自家発電用交流発電機6の交流出力は第2整流装置7を介して直流母線P，Nの極性に合わせかつ出力電圧を調節して直流母線P，Nに供給される。またエンジン5aで駆動されて中速回転(1,000～2,700RPM)する自家発電用交流発電機6aの交流出力も第3整流装置7aを介して上記と同様に極性と出力調整されて直流母線P，Nに供給される。太陽光電池8および燃料電池9の直流出力は直流母線P，Nに極性と出力を調整されて直接給電される。風力発電機10はその交流出力を第4整流装置11を介して直流母線P，Nに極性と出力を調整されて供給される。12は誘導電動機で、この電動機12にはインバータ13を介して直流母線P，Nから電力が供給される。14は直流負荷であり、15は停電防止用の蓄電池で、この蓄電池15は、例えばフローティング方式により充電される。

本実施例は上記のように商用電源2は第1整流装置3でエンジン駆動発電機6，6aは第2，第3整流装置7，7aでそれぞれ整流してから、また太陽電池8、燃料電池9などの発電設備の出力は直接に風力発電機11の出力は第4整流装置11で直流母線P，Nに供給される。このため、各直流出力はその極性を合わせかつ電圧値を調節するだけの操作で母線P，Nに供給できるようになるので従来の交流配電方式に比べて容易となる。従って直流負荷14は直接に直流母線P，Nに接続すればよく、また、交流負荷12に対しては、現在広く実用されているインバータ13を用いて接続すれば良い。さらに、直流母線P，Nには蓄電池15を接続したことによって、無停電電源装置ともする

ことができる。

H．発明の効果

本発明は以上説明の構成から下記の効果を奏する。

(1)本発明は直流または直流化した交流発電設備を直流母線に並列接続して構成した配電系統であるから、交流配電系統のように、同期並列投入操作が不要であり、構成操作が簡単である。

(2)本発明は直流電力給電の並列方式であるから、直流電源の出力電圧を調整して並列接続すればよく、交流電力の並列方式のように有効電力・無効電力の制御を必要としない。

(3)本発明は直流電力の直流母線への並列接続方式であるので、直流母線に接続したエンジン駆動交流発電機の出力がエンジンの回転速度変動に伴って高くなっても、上記直流母線には無停電用の蓄電池が接続されているため、支障は生じない。交流配電方式では、発電機駆動エンジンの速度変動率によって、発電機の有効電力量の変位が定まる。従って、本発明はエンジン速度変動率を規定する必要がない特色を有する。

(4)本発明は直流電力の直流母線への並列方式であるので、直流母線に接続するエンジン駆動発電機のエンジンの回転数を任意に選定でき、最高効率速度でエンジンを運転できる。交流発電方式では、N=(120/P)×f(但し、P…極数、f…電源周波数)から交流発電機の回転数が規定される。

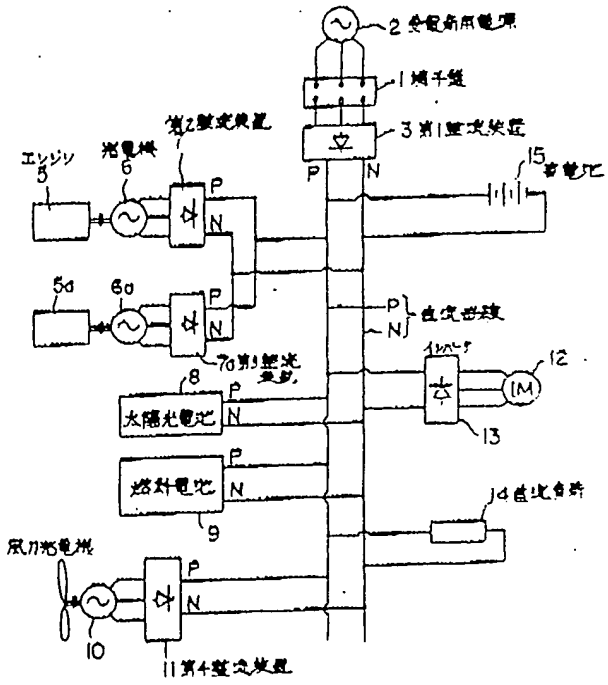
(5)本発明は直流配電方式であるので、電圧降下は抵抗分の電圧降下となり、施設内母線等のブス・ダクトの電圧降下が小さくなる。交流配電方式ではリアクトルおよび表皮効果が電圧降下に関与するので、本発明より電圧降下が大きい。

(6)直列母線に蓄電池を接続することによって、無停電電源装置を形成できる。

4．図面の簡単な説明

図面は本発明の一実施例の電気回路図である。

2…受電商用電源、3，7，7a，11…第1～第4整流装置、P，N…直流母線、5，5a…エンジン、6，6a…交流発電機、8…太陽光電池、9…太陽電池、10…風力発電機、12…誘導電動機、13…インバータ、14…直流負荷、15…蓄電池。



TCA

The Translating Company

CERTIFICATE OF ACCURACY

STATE of New York) SS:
County of New York)

Gertrud Mathys being duly sworn, deposes and says that she is the President of Translation Company of America, 10 West 37th Street, New York, NY 10018 and that she is thoroughly familiar with Ben Tompkins, a professional qualified translator who translated the attached document relating to:

Japanese Patent S62-254626

from the Japanese language into the English language, and that the English text is a true and correct translation of the original, to the best of her knowledge and belief.

Sworn before me this
20th day of March 2002

Notary Public

NAVADIA MOORE
Notary Public, State of New York
No. 01MO4764382
Qualified in Queens County
Commission Expires June 30, 2002

MEID ★ X12 87-351855/50 ★J6 2254-628-A

Parallel operation of DC power for factory and building - supplies AC source converting it to DC bus bar, and fuel battery source supplied adjusting polarity and voltage NoAbstract Dwg 1/1

MEIDENSHA ELEC MFG KK 28.04.86-JP-098558

(06.11.87) H02j-01/10

28.04.86 as 098558 (3pp)

N87-263706 **X12-H1A**